CHAPTER 10 Study Guide

Key Concepts

10.1 The Mole: A Measurement of Matter

- Three methods for measuring the amount of a substance are by count, by mass, and by volume.
- A mole of any substance always contains Avogadro's number of representative particles, or 6.02×10^{23} representative particles.
- The atomic mass of an element expressed in grams is the mass of a mole of the element.
- To calculate the molar mass of a compound, find the number of grams of each element contained in one mole of the compound. Then add the masses of the elements in the compound.

10.2 Mole–Mass and Mole–Volume Relationships

- The molar mass of an element or compound is the conversion factor for converting between the mass and the number of moles of a substance.

One mole of any substance contains Avogadro's number of particles, so 22.4 L of any gas at STP contains 6.02×10^{23} representative particles of that gas.

11.2 Types of Chemical Reactions

- The five general types of reactions are combination, decomposition, single-replacement, double-replacement, and combustion.
- The number of elements and/or compounds reacting is a good indicator of possible reaction type and thus possible products.

- In a combination reaction, there is always a single product.
- A decomposition reaction involves the breakdown of a single compound into two or more simpler substances.
- In a single-replacement reaction, both the reactants and the products are an element and a compound.
- A double-replacement reaction generally takes place between two ionic compounds in aqueous solution.
- A combustion reaction always involves oxygen as a reactant.

CHAPTER 11

10.3 Percent Composition and Chemical Formulas

- To determine the percent by mass of any element in a given compound, divide the element's mass by the mass of the compound and multiply by 100%.
- An empirical formula of a compound is the simplest whole-number ratio of atoms of the elements in the compound.
- The molecular formula of a compound is either the same as its experimentally determined empirical formula, or it is a simple whole-number multiple of it.

Key Concepts

11.1 Describing Chemical Reactions

- To write a word equation, write the names of the reactants to the left of the arrow separated by plus signs; write the names of the products to the right of the arrow, also separated by plus signs.
- To write a skeleton equation, write the formulas for the reactants to the left of the yields sign and the formulas for the products to the right.
- After writing the skeleton equation, use coefficients to balance the equation so that it obeys the law of conservation of mass.

Key Concepts

12.1 The Arithmetic of Equations

- A balanced chemical equation provides the same kind of quantitative information that a recipe does.
- Chemists use balanced chemical equations as a basis to calculate how much reactant is needed or product is formed in a reaction.
- A balanced chemical equation can be interpreted in terms of different quantities, including numbers of atoms, molecules, or moles; mass; and volume.
- Mass and atoms are conserved in every chemical reaction.

CHAPTER 12

Study Tip

Organize New Information Different people learn in different ways. If you learn best visually, draw concept maps, outlines, and diagrams to help you organize the chapter content. If you learn best by listening, take turns reading the chapter aloud with a partner.

Vocabulary

- % mass of element $= \frac{\text{mass of element}}{\text{mass of compound}} \times 100\%$
- Avogadro's hypothesis (p. 300)
- Avogadro's number (p. 290)
- empirical formula (p. 309)
- molar mass (p. 294)
- molar volume (p. 300)
- mole (mol) (p. 290)
- percent composition (p. 305)
- representative particle (p. 290)
- standard temperature and pressure (STP) (p. 300)
- balanced equation (p. 325)
- catalyst (p. 323)
- chemical equation (p. 323)
- coefficients (p. 325)
- combination reaction (p. 330)
- combustion reaction (p. 336)
- complete ionic equation (p. 342)
- decomposition reaction (p. 332)
- double-replacement reaction (p. 334)
- skeleton equation (p. 323)

$n = \frac{m}{M}$ $\quad n = \frac{\#\text{particles}}{6.02 \times 10^{23}\ \text{particles/mol}}$

m → is mass in g

M → molar mass in g/mol → using periodic table

△ Sealed Flask Problems AND Empirical Formula as well as Molecular Formula